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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/725,939	12/03/2003	Chad A. Mirkin	083847-0231	4466

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EXAMINER	
CULBERT, ROBERTS P	

ART UNIT	PAPER NUMBER
1763	

DATE MAILED: 12/15/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/725,939	MIRKIN ET AL.	
	Examiner	Art Unit	
	Roberts Culbert	1763	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *11/7/06*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-75* is/are pending in the application.

4a) Of the above claim(s) *5,6,9,20,25,29,40,45,49,60,63 and 66-75* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-4,7,8,10-19,21-24,26-28,30-39,41-44,46-48,50-59,61,62,64 and 65* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *03 December 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *8/27/04*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

Applicant's election of Group I, (claims 1-66) and Species 1A (scanning probe tip), IIB (non-hollow tip) and IIIA (patterning compound applied in continuous manner), in the reply filed on 11/7/06 is acknowledged. Because applicant did not distinctly and specifically point out the supposed errors in the restriction requirement, the election has been treated as an election without traverse (MPEP § 818.03(a)).

Claims 5, 6, 9, 20, 25, 29, 40, 45, 49, 60, 63 and 66-75 are withdrawn from further consideration pursuant to 37 CFR 1.142(b), as being drawn to a nonelected invention, there being no allowable generic or linking claim.

Claim Objections

Claim 38 is objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-4, 7, 12, 14 and 19 are rejected under 35 U.S.C. 102(b) as being anticipated by U.S. Patent 5,618,760 to Soh et al.

Regarding Claim 1, Soh et al. teach a method of nanolithography comprising: providing a substrate and a tip (Col. 1, Lines 49-59); using the tip to apply an oxide patterning compound (73) to the

substrate so as to produce a desired pattern which is a chemical etching resist, and chemically etching the substrate. (Col. 2, Lines 32-37)

Regarding Claims 2, 3 and 19, Soh et al. teach the substrate may comprise a semiconductor and/or a metal layer. (Col. 7, Lines 51-57 and Col. 8, Lines 43-56)

Regarding Claim 4, and 19, Soh et al. teach a scanning probe microscope tip. (Col. 3, Lines 3-5)

Regarding Claim 7, Soh et al. substantially teach a non-hollow tip. (Figure 1)

Regarding Claim 12 and 19, Soh et al. teach the pattern may comprise a self-assembled monolayer. (Col. 8, Lines 53-56)

Regarding Claim 14, Soh et al. substantially teaches that the desired pattern may comprise dots or lines as broadly recited by applicant. (Col. 1, Line 65-67 and Col. 6, Lines 16-18)

Claims 1-4, 7, 10-12, 17, 19, 21-24, 30-32 and 37 are rejected under 35 U.S.C. 102(b) as being anticipated by the IBM Technical Disclosure Bulletin Publication (TDB) "Fabrication of Gold Nanostructures by Lithography with Self Assembled Monolayers"

Regarding Claims 1, and 21 the IBM TDB teaches a method of nanolithography comprising: providing a substrate and a tip; using the tip to apply a patterning compound (SAM) to the substrate so as to produce a desired pattern which is a chemical etching resist, and chemically etching the substrate. (Please refer to entire disclosure and figures) Note: that the tip displaces one SAM for another SAM, however, this step effectively "applies a patterning compound to the substrate using the tip", as broadly recited by applicant.

Regarding Claims 17, 21 and 37, The IBM TDB teaches that after etching, the pattern is characterized by features of about 50nm or less. (See Figure d. under "SAM processing")

Regarding Claims 2, 3, 22, 23 IBM TDB teaches a metal surface (gold) and a silicon semiconductor surface.

Regarding Claims 4, 19 and 24, IBM TDB teaches a scanning probe microscope tip. (STM)

Regarding Claims 7 and 26 IBM TDB teach a non-hollow tip (See Figure a. under "SAM processing")

Regarding Claims 10-12, 19, 30-32 IBM TDB teaches a self-assembled monolayer of a sulfur-containing compound (Hexadecanethiol) that can chemisorb or covalently bond with the substrate.

Claims 1-3, 7, 8 and 10-16 are rejected under 35 U.S.C. 102(b) as being anticipated by the Publication "Patterning Self-Assembled Monolayers: Applications in Materials Science to Kumar et al."

Regarding Claim 1, Kumar et al. teaches a method of nanolithography comprising: providing a substrate and a stamp having a tip (protrusion); using the tip to apply a patterning compound to the substrate so as to produce a desired pattern which is a chemical etching resist, and chemically etching the substrate. (See Figures 1 and 6 and related discussion)

Regarding Claims 2 and 3, Kumar et al. teaches a metal surface (gold) and a silicon semiconductor surface. (Figures 1 and 6)

Regarding Claim 7, Kumar et al substantially teaches a non-hollow tip (stamp)

Regarding Claims 8, since, for example, the tips of the stamp are exposed to the alkanethiol for a period of time; Kumar substantially teaches that the patterning compound is supplied to the tip continuous manner as broadly recited by applicant.

Regarding Claim 13 and 14, Kumar et al. teach the pattern comprises an array of dots, lines. (See Figures 4, 5 8, and 9, for example)

Regarding Claim 10-12, Kumar et al. teaches the desired pattern comprises a self-assembled monolayer (SAM) which including a sulfur-containing compound (thiol group) that can chemisorb or covalently bond to the surface.

Regarding Claim 15, Kumar et al. teach (Figures 5 and 6) pattern sizes on the order of a few microns. (i.e., a few thousand nanometers) Since applicant has not provided a specific definition of the term "nanogap" with respect to the claims, absent evidence to the contrary, it is the examiner's position that a pattern gap size on the order of a few thousand nanometers anticipates a "nanogap" as broadly recited.

Claims 1-3, 7, 13-18, 21-23, 26, 33-35, 37, 38, 41-43, 46, 53-58, 61 and 62 are rejected under 35 U.S.C. 102(b) as being anticipated by U.S. Patent 5,772,905 to Chou et al.

Regarding Claims 1, 17, 18, 21, 37, 38, 41, 57, 58, 61 and 62, Chou et al. teach a method of nanolithography comprising: providing a substrate and a tip; using the tip to apply a patterning compound to the substrate so as to produce a desired pattern which is a chemical etching resist, and chemically etching the substrate (Col. 6, Lines 13-23) wherein the pattern after etching is characterized by features of about 50nm or less and inter-feature gaps of about 100 nm or less. (Col. 3, Lines 60-65)

Regarding Claim 61, Chou teaches a plurality of tips under computer control as broadly recited by applicant (Figure 9)

Regarding Claims 3, 23 and 43, Chou teaches a silicon wafer substrate (18)

Regarding Claims 7, 26, and 47 Chou substantially teaches a non-hollow tip.

Regarding Claims 2, 22 and 42 Chou teaches the substrate may comprise a metal surface (32)

Regarding Claim 46, Chou teach that a plurality of tips are used to apply a plurality of patterning compounds.

Regarding Claim 56, Chou teaches sub-25 nm resolution. (Col. 3, Lines 60-65)

Regarding Claims 13-16, 33-35, 53-55, Chou teaches that the pattern may comprise an array of dots or lines such as electrodes having a nanogap. (See Figures 2-4, 6 and 7, for example)

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary.

Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 17, 18, 21-23, 26, 28, 30-35, 37, 38, 41-43, 46-48, 50 and 52-58 are rejected under 35 U.S.C. 103(a) as being unpatentable over the Publication "Patterning Self-Assembled Monolayers: Applications in Materials Science to Kumar et al."

Regarding Claims 17, 18, 21, 37, 38, 41 and 56-58, Kumar et al. do not expressly teach that the pattern after etching is charachterized by features 50nm or less and gaps of 100nm or less. However, since the feature size of the product is simply a result of performing the claimed method, and the method steps of Kumar et al. and the claimed method are the same, the same size features would be achieved, by the method of Kumar et al, or else arise from essential limitations not provided in the claims.

Regarding Claims 22 and 23, Kumar et al. teaches a metal surface (gold) and a silicon semiconductor surface. (Figures 1 and 6)

Regarding Claims 26 and 47, Kumar et al substantially teaches a non-hollow tip (stamp)

Regarding Claims 28 and 48, since, for example, the tips of the stamp are exposed to the alkanethiol for a period of time; Kumar et al. substantially teaches that the patterning compound is supplied to the tip continuous manner as broadly recited by applicant.

Regarding Claims 33, 34, 53 and 54, Kumar et al. teach the pattern comprises an array of dots, or metal lines. (See Figures 4, 5 8, and 9, for example)

Regarding Claim 30-32, 50 and 52, Kumar et al. teaches the desired pattern comprises a self-assembled monolayer (SAM) which including a sulfur-containing compound (thiol group) that can chemisorb or covalently bond to the surface.

Regarding Claims 35 and 55, Kumar et al. teach (Figures 5 and 6) pattern sizes on the order of a few microns. (i.e., a few thousand nanometers) Since applicant has not provided a specific definition of the term "nanogap" with respect to the claims, absent evidence to the contrary, it is the examiner's

position that a pattern gap size on the order of a few thousand nanometers anticipates a "nanogap" as broadly recited.

Double Patenting

The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

Claims 1-4, 7, 8, 10-19, 21-24, 26-28, 30-39, 41-44, 46-48, 50-59, 61, 62, 64 and 65 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-20 of U.S. Patent No. 6,635,311 in view of the Publication "Patterning Self-Assembled Monolayers: Applications in Materials Science to Kumar et al.".

Claims 1-20 of U.S. Patent No. 6,635,311 teach a method of nanolithography comprising: providing a substrate and an atomic force microscope tip (scanning probe microscope); using the tip to apply a patterning compound to the substrate so as to produce a desired pattern of dots or lines using the atomic force microscope tip.

Claims 1-20 of the conflicting patent do not expressly teach that the substrate is etched using the patterning compound as an etching resist. However, Claims 1-20 do recite that the sulfur patterning compound is a thiol self-assembled monolayer chemisorbed on a gold substrate. Kumar et al. teaches that it is known to use patterns of self-assembled molecules such as thiols to pattern gold substrates and the like using chemical etching. It would have been obvious to one skilled in the art at the time the

claimed invention was made to use chemical etching to pattern a substrate in a line or dot array in the well-known manner.

Regarding Claims 17, 18, 21, 37, 38, 41, 56-58, 61 and 62, Kumar et al. does not expressly teach gaps of about 100nm or less (nanogaps) or features of about 50 nm or less after etching. However, since U.S. Patent No. 6,635,311 teach the monolayer is may be a grid of lines (Claim 12) lines of about 100nm or less (Claim 20) the nanoscale pattern would be formed by a conventional etching process as shown by Kumar et al.

Claims 1-4, 7, 8, 10-19, 21-24, 26-28, 30-39, 41-44, 46-48, 50-59, 61, 62, 64 and 65 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-192 of U.S. Patent No. 6,827,979 in view of the Publication "Patterning Self-Assembled Monolayers: Applications in Materials Science to Kumar et al."

Claims 1-192 of U.S. Patent No. 6,827,979 teach a method of nanolithography comprising: providing a substrate and a tip; using the tip to apply a patterning compound to the substrate so as to produce a desired pattern using an atomic force microscope tip.

Claims 1-192 of the conflicting patent do not expressly teach that the substrate is etched using the patterning compound. However, Claims 1-192 do recite that the method is uses to prepare an etching resist (Claim 47) and that the patterning compound may be a self-assembled monolayer such as a thiol or alkanethiol chemisorbed on a gold substrate. Kumar et al. teaches that it is known to use patterns of self-assembled molecules such as thiols to pattern gold substrates and the like using chemical etching. It would have been obvious to one skilled in the art at the time the claimed invention was made to use chemical etching to pattern a substrate in a line or dot array in the well-known manner.

Regarding Claims 17, 18, 21, 37, 38, 41, 56-58, 61 and 62, Kumar et al. does not expressly teach gaps of about 100nm or less (nanogaps) or features of about 50 nm or less after etching. However, since U.S. Patent No. 6,827,979 teach the monolayer is may be one of individual lines (Claim 16) lines with line width of about 30-100nm (Claim 20) the nanoscale pattern would be formed by a conventional etching process as shown by Kumar et al.

Further, regarding Claim 61, Claims 1-192 of the conflicting patent do not expressly teach computer-controlled tips. However, Claims 1-192 of the conflicting patent do teach multiple AFM tips in a device, controlled tip-substrate scan speed (Claim 135) and repeating with different inks on the same substrate. (Claim 150) thus, it would have been obvious to one skilled in the art at the time the claimed invention to provide process control, a computer being an obvious expedient, long recognized in the process control art for this purpose.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Roberts Culbert whose telephone number is (571) 272-1433. The examiner can normally be reached on Monday-Friday (8:30-5:00).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Parviz Hassanzadeh can be reached on (571) 272-1435. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

R. Culbert
Examiner
Art unit 1763